

LITORIA RICHARDSI SP. NOV., A NEW TREEFROG
(ANURA: HYLIDAE) FROM NEW GUINEA

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Dennis, A.J. & Cunningham, M.J. 2006 11 10: *Litoria richardsi* sp. nov., a new treefrog (Anura: Hylidae) from New Guinea. *Memoirs of the Queensland Museum* 52 (1): 65-70. Brisbane. ISSN 0079-8835.

A distinctive new species of *Litoria* is described from central New Guinea. It is a small species (adult female 29.5mm; adult male 26.5mm SVL) with full, thick, black webbing on the hands and feet. In life the ventral surface is strikingly patterned with black, white and yellow. The periphery of the tympanic membrane is transparent, a character shared with only one other Australopapuan hylid frog. The relationship of this species to other *Litoria* is unclear. It does not appear to belong in any of the currently recognised species-groups within the genus. □ *Hylidae, Litoria, new species, New Guinea, rainforest.*

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The Australopapuan hylid frog genus *Litoria* occurs in habitats ranging from deserts to wet rainforests. The genus is particularly diverse in New Guinea where recent field work has revealed numerous undescribed taxa (Richards, 2001; Richards & Iskandar, 2001, Richards et al., 2000). During 1995 we collected a single specimen of a striking new species of *Litoria* in the foothills of the Star Mountains, Papua New Guinea. Intensive searches at this locality between 1991 and 1999 failed to detect additional specimens but another was collected in the Mamberamo River Basin of Papua Province, Indonesia in 2000 (Richards et al., 2002).

MATERIALS AND METHODS

Specimens are deposited in the South Australian Museum (SAMA), Australia and the Museum Zoologic Bogor (MZB), Indonesia. Measurements (to the nearest 0.1mm) were taken with dial callipers and a stereomicroscope fitted with an ocular micrometer, and follow Menzies (1993). They are: SVL (snout-vent length), TL (tibia length), HW (head width at tympanum), HL (head length from tip of snout to posterior edge of tympanum), EYE (horizontal eye diameter), TYM (horizontal tympanum diameter), IN (internarial distance), EN (distance between anterior edge of eye and posterior edge of naris), 3FD (width of 3rd finger disc at right angle to digital axis) and 3FP (width of penultimate phalanx of 3rd finger), 4TD and 4TP (4th toe disc and 4th toe phalanx, as for 3rd finger).

SYSTEMATICS

Litoria richardsi sp. nov. (Figs 1-2)

MATERIAL. HOLOTYPE: SAMA R60283, adult ♀, 5.5km west of Tabubil township, Western Province, Papua New Guinea (5°17'30"S, 141°11'55"E; Alt. 500m asl), collected by A. Dennis, S. Richards, M. Cunningham 18.XI.1994. PARATYPE: MZB Amph. 11823, adult ♂, forest adjacent to Tiri River, Mamberamo Drainage, Papua, Indonesia (3°17'30"S, 138°34'53"E; Alt. 80m asl) collected by S. Richards and B. Tjaturadi 12.IX.2000.

DIAGNOSIS. Assigned to *Litoria* on the basis of a horizontal pupil when constricted. Small (♂ 26.5mm, ♀ 29.5mm); full, thick, black webbing on fingers and toes; colour in life predominantly grey-green dorsally merging to blue-grey laterally and on posterior dorsum, marked with irregular black lines and numerous tubercles; venter with extensive areas of black, white and yellow; periphery of tympanic membrane transparent.

DESCRIPTION. *Female*. (Figs 1A, C-D) Holotype measurements (mm). SVL 29.5; TL 17.5; HW 8.6; HL 8.4; EYE 3.2; TYM 2.2; IN 2.6; EN 3.1; 3FD 1.5; 3FP 1.0; 4TD 1.2; 4TP 0.9. Head slightly broader than long (HL/HW 0.98), less than one third of snout-vent length (HL/SVL 0.28); snout slightly rounded in dorsal aspect, blunt; near vertical in lateral view. Canthus rostralis rounded, gently curved; loreal region distinctly concave. Nostrils close to tip of snout; internarial distance less than distance between naris and eye (EN/IN 1.19). Eyes large (EYE/SVL 0.11), pupil

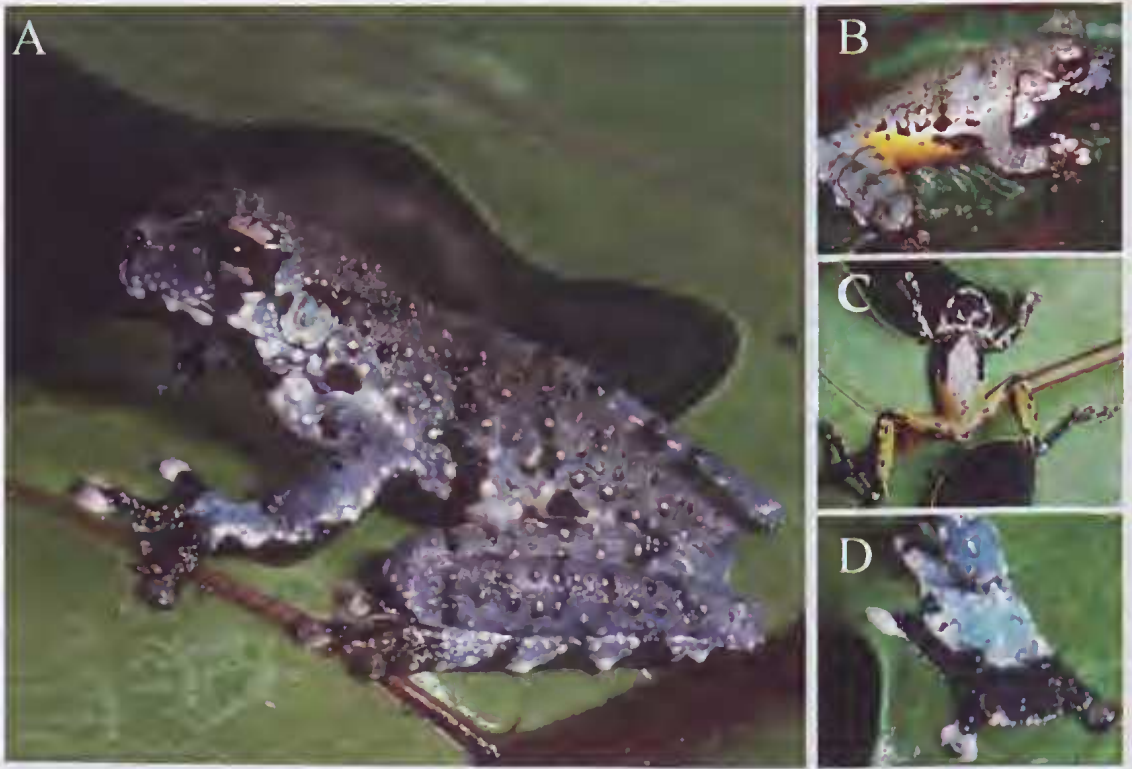


FIG. 1. *Litoria richardsi* sp. nov. A, adult female holotype habitus; B, adult male paratype habitus; C, female holotype ventral; D, female holotype hand.

horizontal. Vomerine teeth poorly developed, in two small clumps between choanac; tongue cordiform. Tympanum clearly visible; periphery of tympanic membrane transparent; dorsal, anterior and ventral edges with increasingly smaller black patches, centre aqua. Fingers long, extensively webbed, relative lengths $3 > 4 > 2 > 1$; webbing black, fleshy, reaching penultimate tubercle on 3rd and 4th fingers and extending to discs as a broad fleshy fringe; webbing reaching disc on 2nd finger. Terminal discs are large (3FP/3FD 0.67). Black webbing reaching to discs on toes 5, 3 and 2, to penultimate tubercle on toe 4, and slightly short of disc on toe 1; relative lengths $4 > 5 = 3 > 2 > 1$, terminal discs moderate (4TP/4TD 0.75).

Colour pattern. In life, predominantly blue-grey (Fig. 1A), merging into grey-green on upper dorsum with irregular black bars across body; foot with triangular black cross bars and prominent white tubercles laterally (Fig. 1A). Numerous conical tubercles on limbs and dorsum including snout; tubercles white on lateral part of body; white, grey-green, blue-grey or black on dorsum and limbs; four prominent blue-grey

tubercles along top of cyclids; series of white spots and tubercles running from rear edge of eye to angle of jaws and extending backwards to point of arm insertion. Iris with black anterior and posterior patches, white dorsally and ventrally with tiny, triangular black incursions from edges. Black stripe through vent is partly interrupted by distinct patch of white tubercles on either side of and below vent. Underside of feet black with scattered white tubercles; legs groin and sides of belly yellow with scattered black patches; belly white, framed by yellow posteriorly and black patches extending from flank to centre of upper chest. Undersides of arms, throat and chin black with extensive white patches, particularly in a band across throat and along lower jaw (Fig. 1C).

Male. (Fig. 1B) Paratype measurements (mm). SVL 26.5; TL 14.4; HW 9.0; HL 7.7; EYE 3.4; TYM 2.3; IN 2.5; EN 2.6; 3FD 1.4; 3FP 1.0; 4TD 1.4; 4TP 0.9. Similar to female in most respects but differing as follows: overall colour more green than blue (Fig. 1B); webbing reaching disc on 2nd finger of right hand and halfway between penultimate tubercle and disc on left hand;

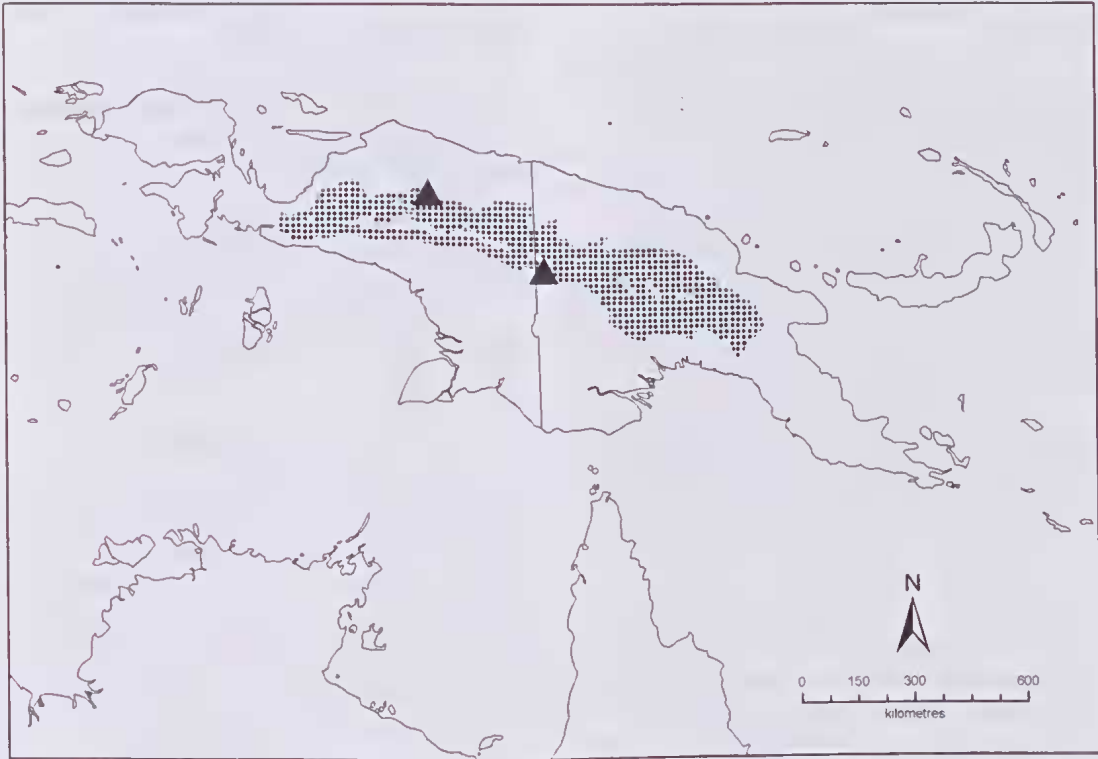


FIG. 2. Map of New Guinea showing collection localities (▲) of *Litoria richardsi*; holotype lower right and paratype upper left. The stippling shows the distribution of Central Range montane rainforest (Olson & Dinerstein, 2002).

relative lengths of toes $4 > 3 > 5 > 2 > 1$. The male has nuptial pads and vocal slits and was captured calling from a leaf ~3m high during heavy rain in rainforest at night. The nuptial pads were low, brown and rugose; fitting the structural class of generalised nuptial excrescence (Duellman, 2001).

NATURAL HISTORY. The gravid female holotype was caught at approximately 2200 hours on a low shrub (~1.5m) on the edge of Ok Ma swamp west of Tabubil. Her eggs were at a range of stages, from tiny and unpigmented to mature and heavily pigmented, measuring 1.1mm in diameter. One batch of seven eggs was mature. A second batch of ten less mature eggs all appeared to be at the same stage of development, suggesting that breeding may be sporadic in small clutches. A minimum of fifty eggs could be counted without damaging the specimen but other tiny eggs were visible beneath these, suggesting between 50 and 100 eggs in total. Despite intense searches, no males of the species were found calling in her vicinity. This may have been due to some parts of the swamp being inaccessible to collectors due to sago palm thickets and deep

water. The habitat was complex rainforest in a very wet area (~12000mm of rain per year). The calling male was caught at night, during heavy rain, from a leaf ~3m above a forest trail. It too was in complex, very wet rainforest but at a lower altitude. No other individuals were found calling nearby; nor was there a swamp in the vicinity.

CALL. The call was a harsh chirp, reminiscent of a cricket.

ETYMOLOGY. For Stephen Richards in recognition of his immense contribution to understanding the herpetofauna, its diversity and its conservation, on the island of New Guinea.

DISTRIBUTION. Known only from two localities (Fig. 2): one at mid altitude (500m) in the mountainous headwaters of the Fly River in Western Province, New Guinea; the other at low altitude (80m) to the west in the Tiri River, Mamberamo Drainage, Papua, Indonesia. The species is likely to occupy most of the intervening suitable habitat.

COMPARISON. The new species differs from all Australopapuan hydrid frogs in having thick

black webbing between the fingers and toes and from all species, except the recently described *Litoria singadanae* Richards, in having a partially transparent tympanum (Richards, 2005). Fully webbed fingers distinguish *L. richardsi* from members of the *L. bicolor* group; *L. albolabris* (Wandolleck), *L. majikthise* Johnston & Richards, *L. rubrops* Kraus & Allison and *L. leucova* Tyler, all of which have only basal webbing on the fingers (Tyler, 1968; Tyler & Davies, 1978; Kraus & Allison, 2004) as well as a range of other differentiating characters. *Litoria richardsi* differs from *L. havina* Menzies and *L. nicro* Menzies by lacking a rostral spike; from *L. ollauro* Menzies and *L. umarensis* Günther in having a yellow rather than blue or brown-black inner thigh colour; from *L. wapogaensis* Richards & Iskandar in having a mottled blue-grey to grey-green dorsum rather than a green dorsum with yellow spots; from *L. verae* Günther in being smaller (SVL 26.5 - 29.5mm vs 33.5 - 40.8mm) and having a large and partially transparent tympanum (TYM/EYE 0.68-0.69) rather than a small (TYM/EYE 0.44-0.51) and opaque one; from *L. singadanae* in its striking black ventral markings; and from members of the *L. aruensis* group by lacking a pale stripe along the canthus rostralis and uniform green dorsum (Menzies, 1993; Johnston & Richards, 1994; Richards & Iskandar, 2001; Günther 2004; Menzies & Tyler, 2004; Richards, 2005).

DISCUSSION

Litoria richardsi is a very distinctive species. The full, black webbing, the venter with extensive areas of black, white and yellow and a transparent periphery on the tympanic membrane combined with a small size (<30mm) distinguish *L. richardsi* from all congeners. It does not fit clearly into any of the species groups identified by Tyler & Davies (1978). At a broad level, *L. richardsi* fits Category B of Tyler & Davies (1978); being arboreal, having extensive webbing on the fingers and pigmented eggs. Species groups in this category with extensive webbing on the fingers are either large (e.g. *L. eucnemis* group, *L. peroui* group), uniformly green (e.g. *L. aruensis* group) or have a rostral spike (e.g. *L. prora* group) (Tyler & Davies, 1978). *Litoria richardsi* has several characters similar to those of the *Litoria becki* group, including dark pigments on the ventral surface, coarsely granular skin, small size and fully webbed toes. However, *Litoria richardsi* has extensive webbing on the fingers and pigmented eggs, whereas members of the *L. becki* group

usually have unwebbed fingers and unpigmented eggs (Tyler & Davies, 1978).

Given the extensively webbed fingers and toes and the extreme difficulty in locating specimens, *L. richardsi* is likely to be a canopy dweller and may glide. The small number of mature eggs compared to the number of eggs developing at different stages suggests that it lays small clutches regularly. Its high rainfall habitat and small clutch size suggest that the species may lay in small canopy ponds (those trapped in tree forks and hollows and regularly replenished by high rainfall) as well as in swamps or ponds on the forest floor.

ACKNOWLEDGEMENTS

Ok Tedi Mining Limited provided valuable logistical support during our fieldwork. We are particularly grateful to Ian Wood, Andrew Storey and Ian Roderick of the Environment Department. The Gregory family and James Menzies provided valuable assistance. Roselyn Busasa (Institute of Papua New Guinea Studies) and Dr Navu Kwapena (Department of Conservation and Environment) facilitated processing of our research and export visas. Thanks to Caroline Bruce for producing the map. We thank S.J. Richards and B. Tjaturadi for finding and providing the paratype and Conservation International for funding their survey.

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